# PI predictor: What is it?

To understand what PI predictor is you must first have an understanding of what a PI test is and the benefits that PI tests have when testing an asset. The IEEE standard 43-2000, which is the standard of recommended practice for testing insulation resistance and rotating machines, defines PI as the ratio of insulation resistance at 10 minutes divided by insulation resistance at 1 minute.

**A standard equation for PI is: PI = IR 10min / IR 1min**


As PI results are shown as ratios, they follow a different procedure for understanding the results than a typical insulation resistance test. PI results > 1.5 are regarded as acceptable by IEC60085:-01:1984 for thermal class rating A, and PI results > 2.0 for thermal class ratings B, F and H. Below is a table that can be used to track insulation conditions of an asset depending on the PI result of the Asset:

| Insulation Condition | PI result |
|---|---|
| Poor | < 1 |
| Questionable | 1 – 2 |
| Acceptable | 2 – 4 |
| Good | > 4 |

PI predictor is very similar to a PI test in which they both give the same ratio result, however the PI predictor test delivers this result in a shorter amount of time. As explained before on the PI test, the PI ratio is calculated by **PI = IR 10min / IR 1min.** The PI predictor test uses the IR curve of the test to extrapolate the result at 10 minutes and then calculates the predicted PI value of the Asset under test. During the start of the test, the scale will not flash, then once the prediction has started, the PI scale will start to flash. The prediction is started after 3 minutes under normal circumstances.

As the confidence in the prediction grows, the scale will become narrower. When the PI predictor is 100% confident in the prediction, the test will then automatically end and the predicted PI value will be displayed. The prediction can take between 3 and 7 minutes depending on the testing conditions. If an open circuit is detected, the test will automatically stop after 10 seconds and an error code will appear (UC20).

## PI predictor: What are the benefits?

The main benefit that PI predictor can offer to the tester is the amount of time saving it can achieve, making testing of equipment quicker and therefore more efficient. The more PI tests that someone does, the more time that will be saved by using PI predictor. For example, if an industrial company done 1,000 tests every year on my assets then instead of the tests taking 10,000 minutes (166.6 hours) it would take 3,000 (50 hours) up to 7,000 minutes (116.6 hours), saving a minimum of 50 hours of planned testing maintenance per year from 1,000 PI tests.

## PI predictor user codes:

To assist the user with limiting the amount of time spent testing, we will stop the test should an issue be detected. This will be accompanied by a user code which will help diagnose the issue found within the test. For example, noise can greatly affect the accuracy on a measurement, Pi tests should not be conducted within noisy environments. If an issue like noise on the circuit appears within the test, the instrument will stop the test and give one of the following user codes:

| User code | Description |
|---|---|
| UC10 | Too noisy for prediction |
| UC20 | Not connected (e.g. open circuit) |
| UC30 | Underrange (e.g. short circuit) |

## Summary:

PI predictor is a new method of PI testing that can save time by doing a prediction of the ratio.
PI predictor becomes more useful to an engineer the longer that they use it, this allows engineers to trend PI results quicker and have less time where assets have to be turned off for planned maintenance.
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